

On the composition of the snake fauna of Okwangwo Division of Cross River National Park, a hilly forest-savanna transition zone in south-eastern Nigeria (Squamata: Serpentes)

Zusammensetzung der Schlangenfauna im Okwangwo-Gebiet des Cross River National-parks, einer hügeligen Übergangszone zwischen Wald und Savanne in Südost-Nigeria
(Squamata: Serpentes)

EDEM A. ENIANG & CLEMENT O. EBIN & LUCA LUISELLI

KURZFASSUNG

Im Hügelland Südost-Nigerias (Okwangwo Division, Cross River Nationalpark; Höhenlage: 300 bis 1800 m ü NN) wurde die Zusammensetzung der Schlangenfauna einer Savannen-Wald-Übergangszone untersucht. Die Artenvielfalt erwies sich mit 28 festgestellten Formen als hoch (3 Pythonidae, 12 Colubridae, 3 Elapidae, 1 Atractaspididae, 6 Viperidae, 2 Typhlopidae). Die wahrscheinlich häufigste Art war *Causus maculatus* (HALLOWELL, 1842), gefolgt von *Gastropyxis smaragdina* (SCHLEGEL, 1837), *Naja nigricollis* REINHARDT, 1843, *Bitis arietans* (MERREM, 1820) und *B. gabonica gabonica* (DUMÉRIE & BIBRON, 1845). Besonders erwähnt sei das sympatrische Vorkommen von drei *Bitis*-Arten [die Wald-assoziierten Formen *B. gabonica* und *B. nasicornis* (SHAW, 1802) und der Savannenbewohner *B. arietans*], die im Botanischen Garten von Butatong gefangen wurden. Im Untersuchungsgebiet sind (1) die meisten Schlangenarten typische Waldbewohner und (2) ähnelt die Okwangwo Schlangenfauna in ihrer artlichen Zusammensetzung jener von typischen Regenwaldgebieten des süd-nigerianischen Flachlandes. Dennoch belegt das Vorkommen von *B. arietans* die Eignung des Untersuchungsgebietes als Lebensraum sowohl für savannen- als auch für waldbewohnende Schlangen.

ABSTRACT

The composition of the snake fauna of a savanna-forest transition zone is studied in a hilly region of south-eastern Nigeria (Okwangwo Division, Cross River National Park; elevation 300 to 1800 m a.s.l.). The snake diversity proved to be high, with 28 species being recorded (3 Pythonidae, 12 Colubridae, 3 Elapidae, 1 Atractaspididae, 6 Viperidae, and 2 Typhlopidae). The most common species was likely *Causus maculatus* (HALLOWELL, 1842), followed by *Gastropyxis smaragdina* (SCHLEGEL, 1837), *Naja nigricollis* REINHARDT, 1843, *Bitis arietans* (MERREM, 1820), and *B. gabonica gabonica* (DUMÉRIE & BIBRON, 1845). Special mention deserves the sympatric occurrence of three species of *Bitis* [i.e. the forest-linked species *B. gabonica*, and *B. nasicornis* (SHAW, 1802), and the savanna-dwelling *B. arietans*], which were captured at the Butatong Botanical Garden. Although the presence of *B. arietans* is a proof that the study area is suitable for both savanna and forest snake species, it should be stressed that (1) the great majority of the species observed are typical forest-dwellers, and that (2) the taxonomical composition of the Okwangwo snake community is relatively similar to that of typical lowland rainforest areas in southern Nigeria.

KEY WORDS

Reptilia: Squamata: Serpentes; ecology; community structure; savanna-forest transition zone; rainforest; tropical Africa; Okwangwo Division of Cross River National Park, Nigeria

INTRODUCTION

Descriptions of the composition and structure of communities of animals, and their variation in relation to the changing habitat gradients within a given geographic region, are crucial steps not only to produce solid ecological science, but also to achieve reliable global conservation strategies for the threatened environments (MAGURRAN 1988). This is especially true as for the trop-

ical regions, where the biodiversity is very rich, the ecological interactions among guilds of animal communities are extremely complex (LUISELLI et al. 1998, 2002; LUISELLI & ANGELICI 2000), and the natural environment is often vulnerable (BARBAULT 1991). In view of it, studies on the structure of snake communities have been conducted in Nigeria since the middle of the 1990s, and

some contributions focusing on swamp-forests, mangroves, and derived savannas have already been published (LUISELLI et al. 1998; LUISELLI & AKANI 1999, 2002; AKANI et al. 1999; ANDREONE & LUISELLI 2000; ENIANG & LUISELLI 2002; ENIANG et al. 2002).

In the present paper we contribute further to this general topic, by providing an inventory list of snake species found in the Okwangwo Division of Cross River National Park, in the northern sector of the Cross River State (south-eastern Nigeria), where a transitional zone between natural savanna and dry rainforest is found in some hilly areas (e.g., Obonyi-Okwa Hills, Boshi Extension area). This area is of exceptional conservational value, due to its rich biodi-

versity and the concomitant occurrence of the last remnant populations of large endemic vertebrates (e.g., *Mandrillus leucophaeus* and *Gorilla gorilla diehli*, cf. OATES 2001).

The present paper aims on providing (1) an inventory list of the species of an area (the northern sector of Cross River National Park) and a habitat (a transition zone between rainforest and natural savanna) which have not been explored in the past with respect to snakes, and (2) to briefly compare this inventory list with more detailed lists available for other habitats of southern Nigeria, i.e. mangroves (LUISELLI & AKANI 2002), swamp-rainforest (LUISELLI et al. 1998; LUISELLI & AKANI 1999; ENIANG & LUISELLI 2002), and derived savannas (AKANI et al. 1999; ENIANG et al. 2002).

MATERIALS AND METHODS

Data presented here refer exclusively to observations and collections made in the Okwangwo Division of the Cross River National Park (Cross River State, Nigeria). The study area, approximately extending from 06°02' to 06°05' N, and 09°02' to 09°04' E, includes the Obonyi-Okwa Hills and the Boshi Extension area, and is limited toward north by the town of Obudu. The altitudes range from about 300 to 1,800 m a.s.l. The area has many disjointed and connected ridge systems, isolated peaks and rock outcrops. The dominant vegetation is sub-montane dry forest, with natural and man-made savanna sectors. To our opinion it is indeed one of the most spectacular transi-

tion zones between natural savannas and rainforest in Nigeria.

Apart from several preliminary field surveys throughout the study area (see ENIANG & LUISELLI 2002, for the details on field methods applied), most of the data presented here come from examination of formalin preserved voucher specimens at the Official Collection of the Cross River National Park, Butatong. These specimens were randomly collected by the rangers of the Park during the period 1998-2001.

All specimens were identified to species. As regards the identification procedures and the names used, see ENIANG et al. (2002).

RESULTS AND DISCUSSION

The snake species found in the study area are listed in table 1. In terms of the number of species, the snake fauna, appeared rich with 28 species recorded (3 Pythonidae, 12 Colubridae, 3 Elapidae, 1 Atractaspididae, 6 Viperidae, and 2 Typhlopidae). Species diversity was high if compared to most of the other sites (with a similar surface in ha) studied up to now in southern Nigeria, which proved to be inhabited by 18 species (mangrove habitat, cf. LUISELLI &

AKANI 2002), 21 and 24 species (swamp-rainforest habitats, cf. AKANI et al. 1999; LUISELLI & AKANI 1999), 27 species (lowland primary rainforest habitat, cf. ENIANG & LUISELLI 2002), 18 species (derived savanna habitat, AKANI et al. 1999), and 19 species (in a recently deforested area, cf. ENIANG et al. 2002) Sound estimates of the abundances of the various species are not available, however, on the basis of both casual sightings in the field and numbers of

Table 1: Inventory of the snakes encountered in the Okwangwo Division of Cross River National Park (Nigeria), in the years 1998-2001, including the catalogue numbers of the museum vouchers at the Collections Centre of the Park, Butatong. F.I.Z.V. - Italian Foundation of Vertebrate Zoology, Rome.

Tab. 1: Die im Okwangwo-Gebiet des Cross River Nationalparks (Nigeria) in den Jahren 1998 bis 2001 festgestellten Schlangen. Für die Museumsexemplare im 'Collections Centre of the Park, Butatong' werden die jeweiligen Katalognummern angegeben. F.I.Z.V. - Italian Foundation of Vertebrate Zoology, Rom.

Taxon	Material	Catalogue number Katalognummer	Notes Anmerkungen
<i>Python sebae</i>	2 ad.	—	In rocky areas, about 1,000 m a.s.l.
<i>Python regius</i>	1 ad.	—	In Felsgebieten in etwa 1000 m Seehöhe. Traded in bush-meat market; captured in Obudu suburbs./ Auf Märkten gehandelt; in den Vorstädten von Obudu gefangen. Found dead at Butatong village.
<i>Calabaria reinhardtii</i>	1 ad.	F.I.Z.V. 441	Totfund im Ort Butatong.
<i>Crotaphopeltis hotamboeia</i>	1 ad.	012	
<i>Lamprophis fuliginosus</i>	1 ad.	006	
<i>Lamprophis lineatus</i>	1 subad.	038	
<i>Gastropyxis smaragdina</i>	3 ad.	013, 020, 028	
<i>Thrasops jacksonii</i>	1 ad.	002	
<i>Dipsadoboa duchesnei</i>	1 ad.	019	
<i>Psammophis cf. phillipsii</i>	4 ad., 1 juv.	005, 016, 044, 045, 048	All specimens with divided anal scutes. Alle Exemplare mit geteiltem Anale.
<i>Thelotornis kirtlandii</i>	1 ad.	033	
<i>Toxicodryas blandingii</i>	1 juv., 1 ad.	040, 047	
<i>Philothamnus</i> sp.	1 juv.	018	Too damaged for specific identification. Zur Artbestimmung zu schlecht erhalten.
<i>Natriciteres fuliginoides</i>	3 ad.	014, 029, 030	
<i>Grayia smythii</i>	1 juv.	003	
<i>Naja nigricollis</i>	3 ad.	001	Both inner forest and open savanna. Im Waldesinneren und in der Savanne.
<i>Naja melanoleuca</i>	1 ad.	—	
<i>Dendroaspis jamesoni</i>	1 ad., 1 juv.	017, 023	
<i>Atractaspis corpulenta</i>	1 ad.	031	
<i>Bitis gabonica gabonica</i>	1 ad.	004	Captured at Butatong Botanic Garden. Gefangen im botan. Garten von Butatong.
<i>Bitis nasicornis</i>	2 ad.	049, 052	Captured at Butatong Botanic Garden. Gefangen im botan. Garten von Butatong.
<i>Bitis arietans</i>	2 ad.	026	Captured at Butatong Botanic Garden, and at Obudu. / Gefangen im botan. Garten von Butatong und bei Obudu.
<i>Atheris squamiger</i>	1 ad.	022	
<i>Causus lichtensteini</i>	1 ad.	051	
<i>Causus maculatus</i>	5 ad.	008, 010, 011, 021, 027	Very common in both forest and savanna. Sehr häufig in Wald und Savanne.
<i>Typhlops congestus</i>	2 ad.	007, 024	
<i>Typhlops undet.</i>	1 ad.	039	

vouchers at the Cross River National Park collection at Butatong, and on personal communications by interviewees, the Night Adder *Causus maculatus* (HALLOWELL, 1842), is most likely the most common species in both forest and savanna spots. Other common species are *Psammophis "phillipsii"* (HALLOWELL, 1844), *Gastropyxis smaragdina* (SCHLEGEL, 1837), *Bitis arietans* (MERREM, 1820), *B. gabonica* (DUMÉRIL & BIBRON, 1845), and *Naja nigricollis* REINHARDT, 1843. We want to point to the

sympatric occurrence of three species of *Bitis* (i.e., the forest-associated species *B. gabonica* and *B. nasicornis* (SHAW, 1802), and the savanna-dwelling *B. arietans*), which were captured at the Butatong Botanical Garden. This latter record is remarkable because, to the best of our knowledge, *B. arietans* has rarely been recorded sympatrically with the other two forest species in other regions of Africa (SPAWLS & BRANCH 1997). In our case, the coexistence between these species is obviously linked to

the transition characteristics of the study area, which presents sites suitable for both savanna- and forest-dwelling species. The same is true for other vertebrate groups, e.g., primates (J. F. OATES, personal communication). In the study area, all species of *Bitis* are eaten by people, and thus actively hunted.

It should be stressed that about half a dozen of other snake taxa which are common in neighbouring areas have most probably "escaped" our attention (comp. inven-

tories in LUISELLI & AKANI 1999, ENIANG et al. 2002, ENIANG & LUISELLI 2002).

In summary, the great majority of the species observed are typical forest-dwellers, and, after all, the taxonomical composition of the Okwangwo snake community is relatively similar to that of both Eket and Port Harcourt areas (LUISELLI et al. 1998; LUISELLI & AKANI 1999), which are typical lowland rainforest areas, although currently severely devastated by the development of industries.

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Corresponding editor: Heinz Grillitsch

AUTHORS: Edem A. ENIANG, Department of Forestry and Wildlife, University of Uyo, P.M.B. 1017, Uyo, Akwa-Ibom State, Nigeria < edemeniang@yahoo.com >; Clement O. EBIN, Chief Executive, Cross River National Park, H.E.P.O. 149 Akamkpa, Calabar, Cross River State, Nigeria < coebin@yahoo.ca >; Dr Luca LUISELLI, Centre of Environmental Studies "Demetra", via dei Cochi 48, I-00133 Rome, Italy < lucamlu@tin.it >.

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